CLAIMS

What is Claimed Is:

1.   A method for managing a plurality of entries in a forwarding table, comprising the steps of:

(a)   segmenting the forwarding table into an address field, a routing tag field, and a hierarchy pointer field; said address field having a fixed bit-length;

(b)   receiving a new entry, said new entry comprising a valid prefix and a routing tag, said valid prefix having a valid prefix bit-length;

(c)   selecting a correcting window according to said valid prefix, wherein said correcting window has a correcting window size equal to said valid prefix bit-length and wherein said correcting window comprises a set of entries in the forwarding table that include said valid prefix, each of said set of entries further comprising an address and a hierarchy pointer value;

(d)   identifying a set of target entries from said set of entries in said correcting window, wherein each of said set of target entries has a hierarchy pointer value less than said correcting window size; and

(e)   adding said routing tag to said routing tag field for each address of said set of target entries and adding said correcting window size to said hierarchy pointer field for each address of said set of target entries.

2.   A method for managing a plurality of entries according to claim 1 further comprising the step of replacing a prefix in the forwarding table.

3.   A method for managing a plurality of entries according to claim 2, wherein said step of replacing a prefix further comprises the steps of:

receiving a prefix to be removed from the forwarding table;

selecting a replacement correcting window according to said prefix, said replacement correcting window having a replacement correcting window size;

identifying a set of target replacements in said replacement correcting window;

5 removing said routing tag from said routing tag field and removing said hierarchy pointer value from said hierarchy pointer field for said set of target replacements;

identifying a replacement entry for said removed routing tag and said removed hierarchy pointer value, wherein said replacement entry has a replacement hierarchical pointer value less than said replacement correcting window size and further comprises a

10 replacement routing tag;

entering said replacement routing tag into said routing tag field and entering said replacement hierarchy pointer value into said hierarchy pointer field for said set of target replacements.

4. A method for managing a plurality of entries according to claim 1, wherein the

15 forwarding table further comprises a mother branch entry having a particular address, and wherein the method further comprises the step of generating and expanding a daughter branch in the forwarding table for said mother branch entry.

5. A method for managing a plurality of entries according to claim 4 wherein said step of generating and expanding a daughter branch further comprises the steps of:

20 further segmenting the forwarding table with a pointer field;

setting an expansion pointer in said pointer field for said particular address, thereby connecting said daughter branch with said mother branch entry; and

segmenting said daughter branch with a daughter branch address field, a daughter

branch routing tag field, and a daughter branch hierarchy pointer field; said daughter branch address field having a daughter branch fixed bit-length.

6. A method for managing a plurality of entries according to claim 5, further comprising the steps of:

receiving a new prefix with routing tag information, said new prefix having a bit-length greater than said fixed bit-length of said address field;

filtering out said particular address from said new prefix to produce a daughter branch valid prefix, said daughter branch valid prefix having a daughter branch bit-length; and

populating said daughter branch with said routing tag information in said daughter branch routing tag field and with said daughter branch bit-length in said daughter branch hierarchy pointer field.

7. A method for managing a plurality of entries according to claim 6, wherein said populating step further comprises the steps of:

selecting a daughter branch correcting window according to said daughter branch valid prefix;

identifying a set of daughter branch target entries in said daughter branch correcting window; and

adding said routing tag information to said daughter branch routing tag field for said set of daughter branch target entries and adding said daughter branch bit-length to said daughter branch hierarchy pointer field for said set of daughter branch target entries.

8. A method for managing a plurality of entries according to claim 7, further comprising the steps of:

further segmenting the forwarding table with an odd field and an even field;

flagging said odd field for said particular address, thereby indicating at least one active entry starting with zero exists in said daughter branch of said mother branch entry; and

flagging said even field for said particular address, thereby indicating at least one active entry starting with one exists in said daughter branch of said mother branch entry.

9. A method for managing a plurality of entries according to claim 8 further comprising the step of removing said routing tag information and said daughter branch bit-length from each of said set of daughter branch target entries.

10. A method for managing a plurality of entries according to claim 8, further comprising the steps of:

unflagging said odd field for said particular address, thereby indicating each entry starting with zero is inactive in said daughter branch of said mother branch entry;

unflagging said even field for said particular address, thereby indicating each entry starting with one is inactive in said daughter branch of said mother branch entry; and

removing said expansion pointer from said pointer field for said particular address, thereby indicating that said daughter branch is not enabled.

11. A method for managing a plurality of entries in a forwarding table, the forwarding table having an address field, a routing tag field, and a hierarchy pointer field, wherein the address field has a fixed bit-length, comprising the steps of:

(a) receiving a prefix to be removed from the forwarding table, said prefix having a valid prefix bit-length;

(b) selecting a correcting window according to said prefix, wherein said correcting

window has a correcting window size equal to said valid prefix bit-length and wherein said correcting window comprises a set of entries in the forwarding table that include said prefix, each of said set of entries comprising an address and a hierarchy pointer value;

(c)   identifying a set of target entries from said set of entries in said correcting window, wherein each of said set of target entries has a hierarchy pointer value equal to said correcting window size and further comprises a routing tag;

(d)   removing said routing tag from the routing tag field for each address of said set of target entries and removing said hierarchy pointer value from the hierarchy pointer field for each address of said set of target entries;

(e)   identifying a replacement entry for said removed routing tag and said removed hierarchy pointer value, wherein said replacement entry has a replacement hierarchical pointer value less than said correcting window size and further comprises a replacement routing tag; and

(f)   entering said replacement routing tag into the routing tag field for each address of said set of target entries and entering said replacement hierarchy pointer value into the hierarchy pointer field for each address of said set of target entries.

12.   A method for managing a plurality of entries according to claim 11, wherein said step for identifying a replacement entry further comprises the steps of:

searching for said replacement entry in said correcting window;

hierarchically truncating said prefix to produce a reduced prefix when said replacement entry is not found in said correcting window;

selecting a compare window having said reduced prefix;

excluding said correcting window from said compare window;

searching for said replacement entry in said compare window;

hierarchically truncating said reduced prefix when said replacement entry is not found in said compare window;

selecting a higher order compare window having said truncated reduced prefix;

5 excluding said correcting window and said compare window from said higher order compare window;

searching for said replacement entry in said higher order compare window; and

repeating said truncating step, selecting step, excluding step and searching steps when said replacement entry is not found.

13. A forwarding table for a router, comprising:

a mother branch containing a plurality of entries, said mother branch further comprising an address field, a routing tag field, a hierarchy pointer field, and a pointer field, wherein said address field, said routing tag field, said hierarchy pointer field, and said pointer field respectively contain a plurality of fixed-length addresses, at least one routing tag, at least one hierarchy pointer, and at least one expansion pointer;

a higher order compare window spanning a set of said plurality of entries; and

an expanded daughter branch connected to said mother branch through said at least one expansion pointer in said pointer field, said daughter branch having at least one entry.

14. A forwarding table according to claim 13, wherein said address field of said mother branch has a fixed bit length.

15. A forwarding table according to claim 14, wherein said daughter branch has a daughter address field with a daughter fixed-bit length.

16. A forwarding table according to claim 15, wherein said daughter fixed-bit length

equals said fixed-bit length.

17. A forwarding table according to claim 16, wherein said daughter fixed-bit length does not equal said fixed-bit length.

18. A forwarding table according to claim 13, wherein said higher order compare window further comprises a correcting window spanning an update set of said plurality of entries and a compare window spanning a replacement set of said plurality of entries, wherein said replacement set is exclusive of said update set.

19. A forwarding table according to claim 13, further comprising an odd field and an even field in said mother branch, said odd field and said even field having an expansion identifier for said daughter branch.

20. A forwarding table according to claim 13, further comprising a means for managing said expansion pointer.